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ABSTRACT

This skills inventory for agricultural occupations was developed by a technical committee in Montana to assist in the development of model curricula and to address state labor market needs. The committee included employers from the forestry industry, members from trade and professional associations, and educators. The validated task list and defined job clusters are intended to provide information on the type and level of knowledge and skills needed for entry, retention, and advancement in Montana agricultural occupations. The guide contains the following: (1) Montana supply and demand occupational information; (2) occupational characteristics of selected jobs in the agricultural industry; and (3) task lists and job titles for agricultural industry occupations in four major categories--agricultural science, agricultural business, agricultural mechanics, and leadership skills. The document includes information on training time for agricultural occupations; mathematics and language training time; physical demands; and environmental working conditions. (KC)

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Montana Center for Research, Curriculum and Personnel Development

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TECHNICAL COMMITTEE ON OCCUPATIONAL CURRICULUM DEVELOPMENT

CE 053 276

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AGRICULTURE TECHNICAL

ADVISORY COMMITTEE

ON CURRICULUM DEVELOPMENT

JOB CLUSTERS, COMPETENCIES AND TASK ANALYSIS

Completed by the Montana
Center for Vocational Education Research,
Curriculum and Personnel Development
Located at Northern Montana College
P.O. Box 7751
Havre, Montana 59501

December 1988

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- Montana State University Ag/IA Department,
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INTRODUCTION

The Carl D. Perkins Vocational Education Act (Public Law 98-524) was enacted in 1984 to replace the Vocational Education Act of 1963 and its subsequent amendments. It is the major vehicle for federal support of vocational education to the states.

The Perkins Act heralded a desire by Congress to better target the responsiveness of vocational and technical education and training to the requirements of the marketplace. The Act sets forth guidelines for implementing this desire by mandating significantly greater involvement of business and industry in the curriculum development process through the mechanism of State Technical Committees.

The Montana State Office of the Commissioner of Higher Education, with the assistance of the State Council for Vocational Education designated 14 distinct business and industry areas for future Technical Committee organization. Five Technical Committees were established for 1988-89 to assist in the development of model curricula and to address state labor market needs. The five committees were responsible for developing an inventory of skills that may be used to define state-of-the-art model curricula for Montana. The five designated committees are:

- TOURISM AND TRAVEL
- AGRICULTURE
- FORESTRY AND LUMBERING
- HEALTH CARE
- MINING AND MINERALS

Montana's Technical Committees represented employers from the industry or occupations for which the committee was established; members from trade or professional organizations representing relevant occupations, and members of organized labor (where appropriate).

Committee members met twice during Fall 1988 to validate relevant skills inventory lists for the foundation of curriculum development. Staff from the Center for Vocational Education served as facilitators. This validated task list and defined job clusters should provide the type and level of knowledge and skills needed for entry, retention, and advancement in Montana.

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MONTANA SUPPLY AND DEMAND INFORMATION

A continuing challenge facing education and training institutions is to identify, design, and offer training programs that serve both the needs of individual participants and the needs of the economy and society as a whole. It is crucial that training programs designed to prepare individuals for specific occupations be realistic in light of anticipated job openings (demand) and the expected number of persons available for and prepared to fill them (supply).

The following projected information can assist in looking into the future job market with some confidence. Through the use of the information individuals and jobs can be matched, thereby decreasing unemployment and increasing job satisfaction. This will also benefit the business community and taxpayers. Through the use of this information, better decisions can be made for the future by having a more realistic knowledge of Montana's employment trends.

The following tables and statistics have been taken from the Montana Supply and Demand Report, Fifth Edition, October 1988, Montana State Occupational Information, Coordinating Committee.

MONTANA AGRICULTURAL OCCUPATIONAL INFORMATION DEMAND REPORT
1986-1995

OCCUPATIONAL TITLE	1986 EMPLOY.	1995 EMPLOY.	EST. ANNUAL OPENINGS
AGRICULTURAL PRODUCTION			
Farm equipment operators	5	5	0
Graders and sorters, agriculture production	7	8	1
All other agriculture, forestry, fishing	506	559	24
AGRICULTURE BUSINESS·			
Purchasing agents and buyers	135	155	11
Farm & home mgmt. advisors	289	305	16
First line supervisors, agriculture, forestry	161	172	4
AGRICULTURE MECHANICS			
Farm equipment mechanics	272	263	9
HORTICULTURE AND LANDSCAPING			
Nursery workers	65	73	8
Gardeners, groundskeepers	860	989	105

*Note: This information is indicative of only salaried, wage-earning agricultural workers who are not self-employed. It should be emphasized these statistics do not truly represent the actual total numbers or averages of agricultural workers on Montana's "family farms".

MONTANA'S DISTRIBUTION OF AGRICULTURAL EMPLOYMENT

	1986 EMPLOY.	% Total	1995 EMPLOY.	% Total	Change Employ.
AGRICULUTRE, FORESTRY, FISHING	4360	1.6	4660	1.5	280

1986-1995 AVERAGE ANNUAL AND TOTAL JOB OPENINGS
AGRICULTURE, FORESTRY, FISHING

AVERAGE ANNUAL OPENINGS:	193
TOTAL JOB OPENINGS;	1740
OPENINGS DUE TO GROWTH	278
OPENINGS DUE TO SEPARATIONS:	1462

MONTANA SUMMARY OF JOB CLUSTERS IN DESCENDING ORDER BY DEMAND, (ESTIMATED ANNUAL OPENINGS VS. TRAINING COMPLETERS)

CLUSTER TITLE	DEMAND	SUPPLY
Sales	1482	554
Institutional and Building Service	822	117
Food Production	523	132
Nursing Assistant	262	138
Heavy Equipment Repair and Operation	229	96
Office and Information Services	188	76
Recreation and Tourism	156	205
Other Medical Technology	150	238
Horticulture and Landscaping	113	24
Electrical and Electronic Technology	106	279
Natural Resources Technology	97	217
Forestry and Lumber Production	64	129
Medical Laboratory	59	193
Dental Technology	56	31
Agriculture Business	55	178
Agriculture Production	36	440
Radiologic Technology	31	22
Medical Records	27	47
Environmental Control Technology	25	24
Marketing Management	14	87
Agriculture Mechanics	12	37
Mechanical Technology	10	105
Emergency Medical Technology	9	1
Fish and Wildlife	3	75

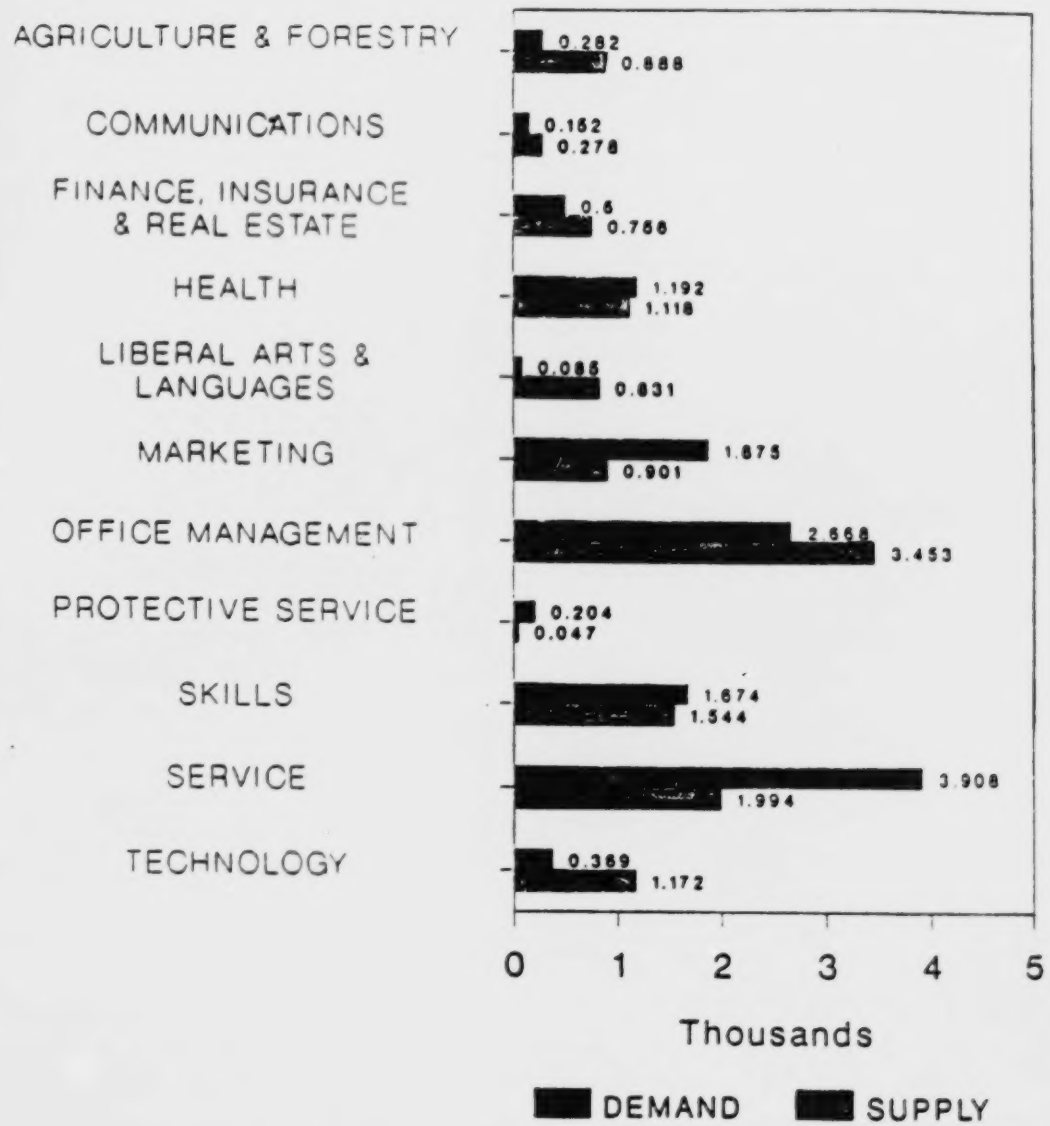
These clusters are representative of clusters found within one or more of the five designated technical advisory committees industry areas: Agriculture, Forestry, Mining and Minerals, Travel and Tourism, and Health Services.

MONTANA OCCUPATIONS RANKED BY ANNUAL OPENINGS TO 1995

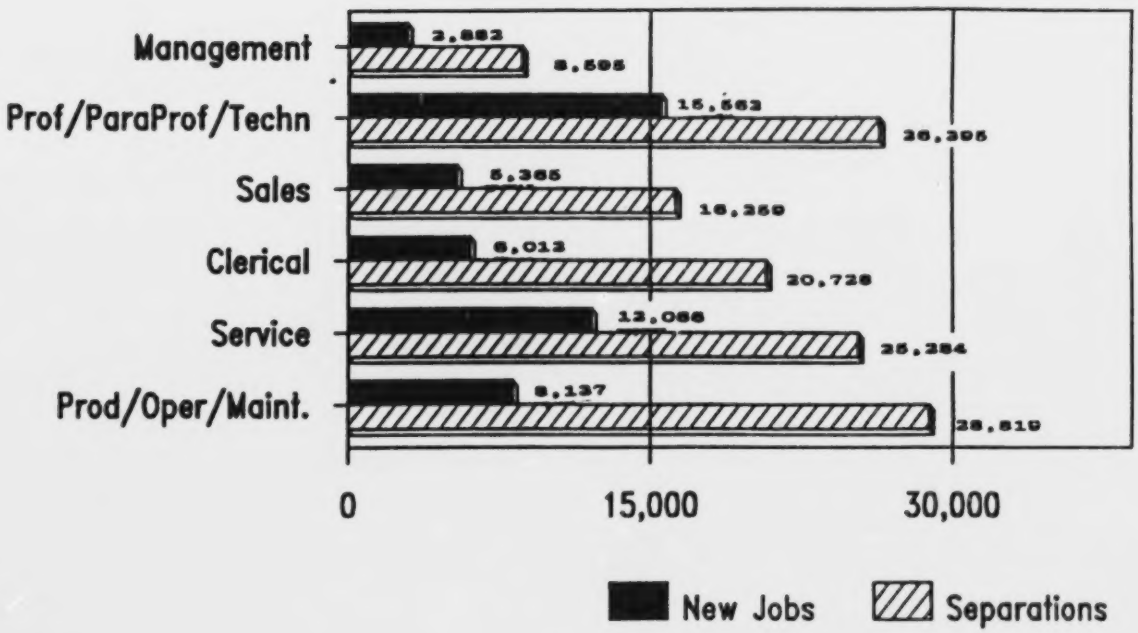
OCCUPATIONAL TITLE	ANNUAL OPENINGS TO 1995
Salespersons, Retail	604
Janitors and Cleaners, excluding Maids	498
Cashiers	324
Waiters and Waitresses	213
Nursing Aides and Orderlies	204
Maids and Housekeeping Cleaners	187
Restaurant Cooks	170
Bartenders	151
Licensed Practical Nurses	108
Gardeners and Groundskeepers	105
Fast Food and Short Order Cooks	105
Combination Food Preparations and Service	97
Institutional or Cafeteria Cooks	88
Food Preparation Workers	88
Receptionists, Information Clerks	75
Institutional Housekeepers	72
Hotel Desk Clerks	65
Food Service and Lodging Managers	65
Guards and Watch Guards	60
Grader, Dozer, Scraper Operators	50
Home Health Aides	44
All Other Foods Service Workers	44
All Other Cleaning, Building Services	43
Bus, Truck, Diesel Eng. Mechanic	40
Bakers, Bread and Pastry	32
Radiologic Technologists and Technicians	30
Butchers and Meat Cutters	29
Dining Room and Bartender Helpers	29
Mobile Heavy Equipment Mechanics	28
Hosts and Hostesses: Restaurant and Lounges	28
Medical Secretaries	27
Amusement and Recreation Attendants	26
All Other Health Service Workers	25
Welders and Cutters	25
All Other Agriculture, Forestry, Fishery Personnel	24
Advertising Sales Agents	23
Travel Agents	23
Machinists	23
Reservation and Transportation Ticket Agent	22
Marketing, Advertising, Public Relations Managers	21
Forest and Conservation Workers	19
Counter and Rental Clerks	19
Excavation Loading Machine Operators	19
Dental Assistants	18
All Other Machinery Mechanics	17
Farm and Home Management Advisors	16
Fallers and Buckers	16
Medical/Clinical Laboratory Technologists	16

Electrical and Electronic Technicians	16
Surveying and Mapping Technicians	16
Medical Assistants	14
Medical Records Technicians and Technologists	13
Sawing Machine Operator, Tender	13
Farm Purchasing Agents and Buyers	11
Machinery Maintenance Workers	11
Millwrights	10
Farm Equipment Mechanics	9
Nursery Workers	8
Logging Tractor Operators	7
Medical/Clinical Laborator Technicians	6
Mining and Related Managers	6
Emergency Medical Technicians	6
Tool Grinders, Filers, Sharpeners	6
Log Handling Equipment Operators	5
Physical Therapy Assistant	5
Recreation Workers	5
Ushers, Lobby Attendants, Ticket Takers	5
Biological, Agriculture Food Technicians	4
First Line Supervisor, Agriculture, Forestry, Fisheries	4
Pharmacy Assistants	4
Choke Setters	3
Crane and Towing Operators	3
Wood Machinists	3
Parking Lot Attendants	3
Well Head Pumpers	3
Curators, Archivists, Museum Technicians	2
Head Sawyers	2
Mine Cutting Machine Operators	2
Agriculture Production Graders and Sorters	1
Log Graders and Scalers	1
Nuclear Medicine Technologists	1
Occupational Therapy Assistants	1

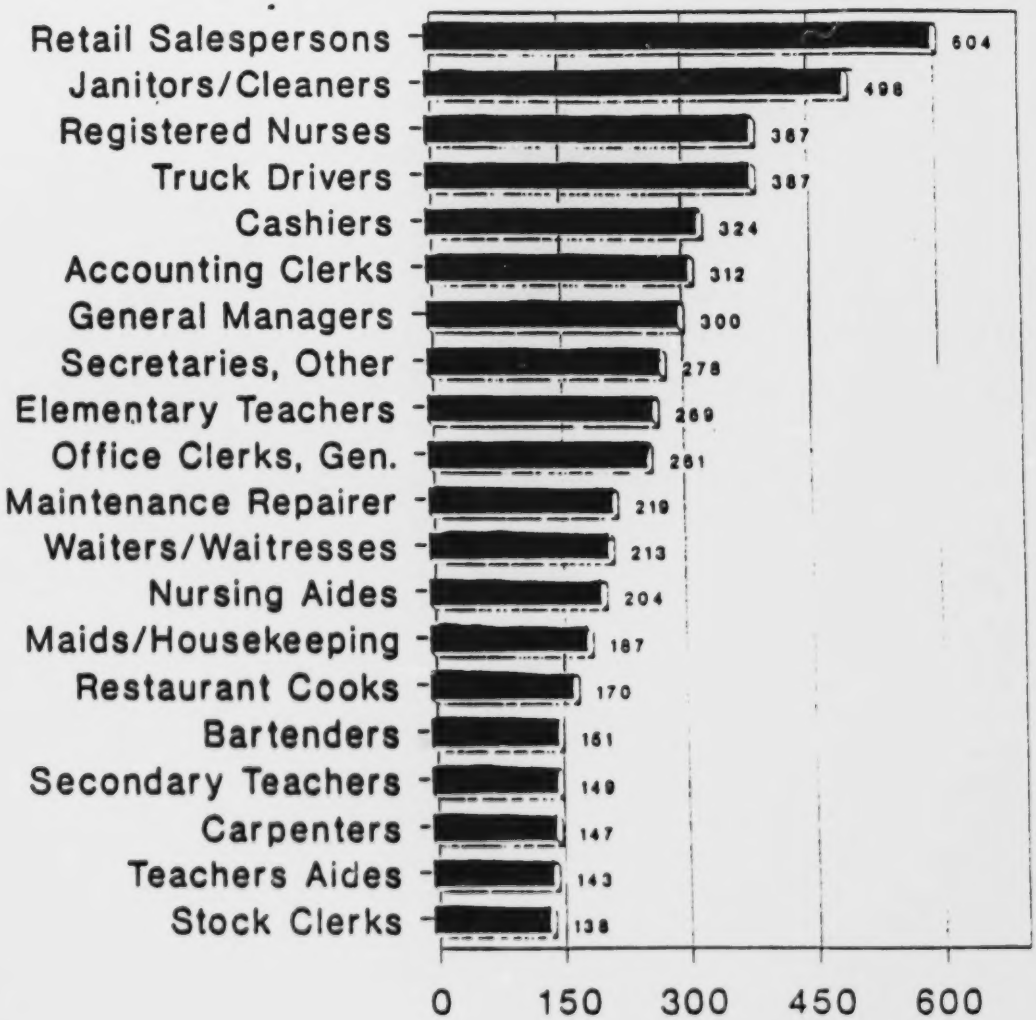
MONTANA CLUSTERS
DEMAND VS. SUPPLY
ESTIMATED ANNUAL OPENINGS VS. TRAINING COMPLETERS



Total Job Openings
Montana Occupations
Growth vs Separations



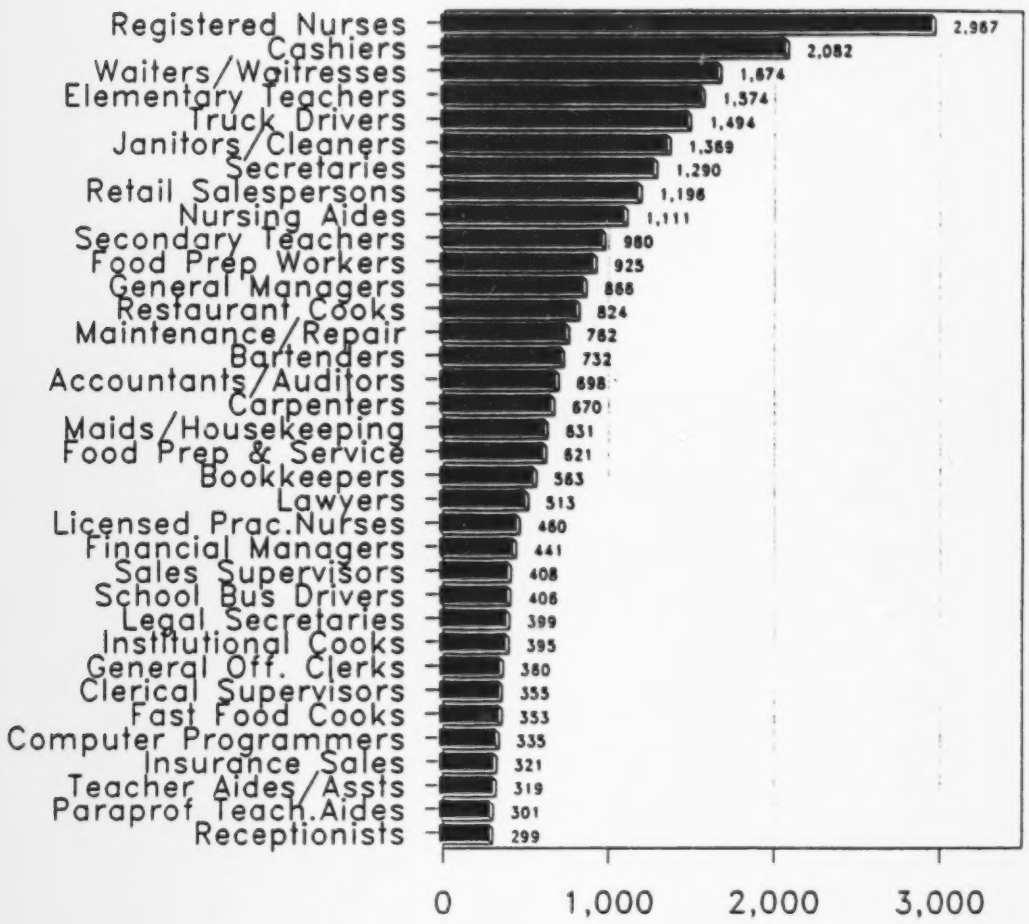
MONTANA
HIGH GROWTH OCCUPATIONS
Estimated Annual Openings to 1995



Montana Job Growth

High Growth Careers

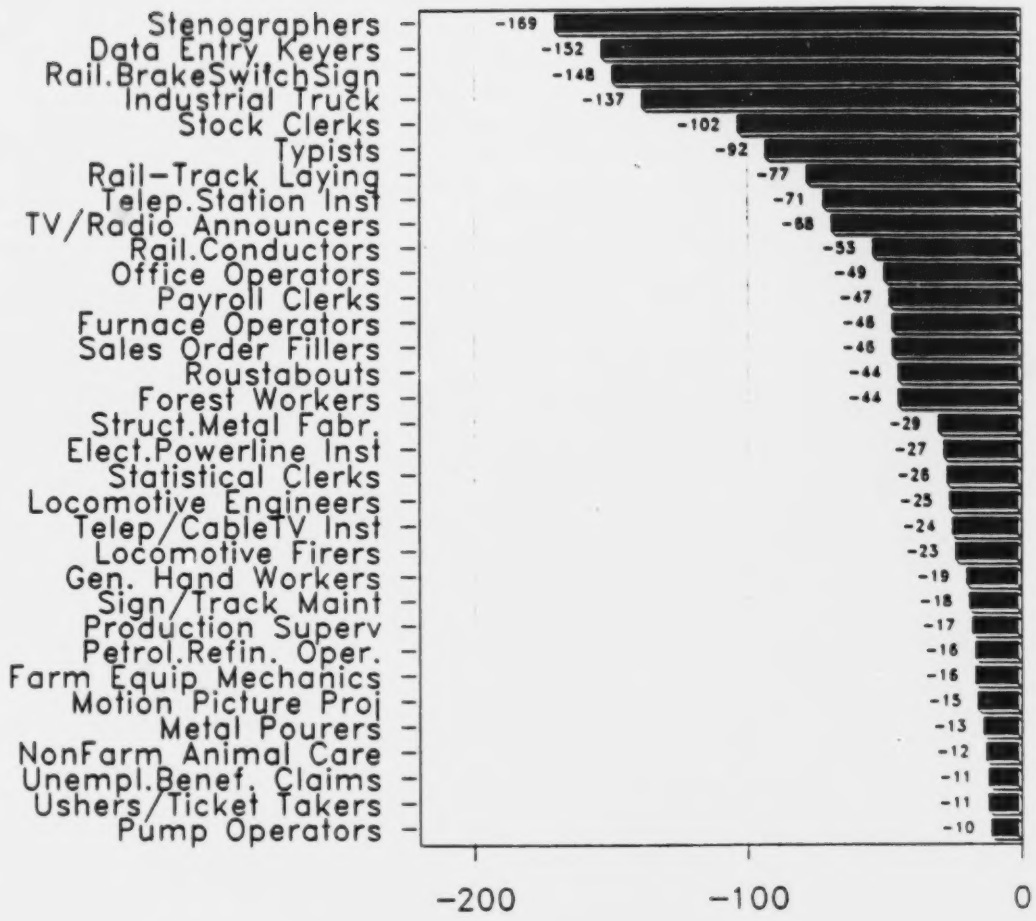
Specific Jobs



Montana Job Growth

Declining Job Areas

Specific Jobs



Occupational Characteristics of Selected Jobs in the Agricultural Industry

The following list of occupations are representive of the Agricultural Industry. While not all of them are found in Montana, they do however represent the most common job titles in the industry.

The selected occupational characteristics are taken from the Dictionary of Occupational Titles and the code to the numbers or letters found in each column is given on the pages following this list. The column marked SVP identifies the Specific Vocational Preparation, or the amount of time required to be trained for the job. The GED columns are marked R M L and are coded to describe the reading, mathematical and language development level necessary to meet the job requirements. The physical demands are noted in the next six columns and the environmental working conditions are coded in the last seven columns.

CIP	DICTIONARY OF OCCUPATIONAL TITLES			GED			PHYSICAL	WORKING	
CODE	CODE	TITLE	SVP	R	M	L	DEMANDS	CONDITIONS	
(04.0801)	040.061-010	AGRONOMIST	8	6	6	6	L 4 6	B	
(00.0000)	040.061-014	ANIMAL SCIENTIST	8	6	6	6	M 4 6	B	
(00.0000)	040.061-018	DAIRY SCIENTIST	8	6	6	6	L 4 6	I	
(00.0000)	040.061-038	HORTICULTURIST	8	6	6	6	L 34 6	B	
(00.0000)	040.061-042	POULTRY SCIENTIST	8	6	6	6	L 4 6	B	
(02.0501)	040.061-058	SOIL SCIENTIST	8	6	6	6	L 4 6	B	
(00.0000)	041.061-014	ANIMAL BREEDER	8	6	6	6	L 4 6	I	
(00.0000)	041.061-018	APICULTURIST	8	6	6	6	L 4 6	B	
(00.0000)	041.061-046	ENTOMOLOGIST	8	6	6	6	L 4 6	B	
(02.0402)	041.061-082	PLANT BREEDER	8	6	6	6	L 4 6	I	
(01.0104)	180.167-018	GENERAL MANAGER, FARM	8	5	4	4	L 5	B	
(01.0104)	180.167-026	MANAGER, DAIRY FARM	8	4	3	3	L 3456	B	
(01.0302)	410.687-022	SHEEP HERDER	3	2	1	1	M 4	O	
(01.0302)	413.161-010	BEEKEEPER	7	3	3	3	M 34	O	6
(01.0204)	624.281-010	FARM-EQUIPMENT MECHANIC 1	7	4	3	3	M23456	B	56
(01.0204)	624.281-014	FARM-EQUIPMENT-MECHANIC APPRENTICE	7	4	3	3	M23456	B	56

1c

Specific Vocational Preparation (Training Time)

This represents the amount of time required to learn the techniques, acquire information, and develop the facility needed for average performance in a specific job-worker situation. The training may be acquired in a school, work, military, institutional, or a vocational environment. It does not include orientation training required of even every fully qualified worker to become accustomed to the special conditions of any new job. Specific vocational training includes training given in any of the following circumstances:

a. Vocational education (such as high school commercial or shop training, technical school, art school, and that part of college training which is organized around a specific vocational objective);
b. Apprentice training (for apprenticeable jobs only);
c. In-plant training (given by an employer in the form of organized classroom study);
d. On-the-job training (serving as learner or trainee on the job under the instruction of a qualified worker);
e. Essential experience in other jobs (serving in less responsible jobs which lead to the higher grade job or serving in other jobs that qualify).

The following is an explanation of the various levels of specific vocational preparation.

Short demonstration.

Level	Time
1	Short demonstration.
2	Anything beyond short demonstration up to and including 30 days.
3	Over 30 days up to and including 3 months.
4	Over 3 months up to and including 6 months.
5	Over 6 months up to and including 1 year.
6	Over 1 year up to and including 2 years.
7	Over 2 years up to and including 4 years.
8	Over 4 years up to and including 10 years.
9	Over 10 years.

Mathematical Development and Language Development (Training Time)

Commonly referred to as "tool knowledges," these embrace those aspects of education (formal and informal) of a general nature that contribute to the acquisition of such skills but do not have a recognized, fairly specific, occupational objective, ordinarily obtained in elementary, high school, or college environs and augmented by past experiences and self-study. They provide linkage between norms used for interpretation of the Basic Occupational Literacy Test (BOLT) scores and level requisites for DOT occupations. Following are the definitions and scale levels applicable to each:

a. Mathematical Developmental or Arithmetic Computation (M): The acquisition of basic mathematical skills, not specifically vocationally oriented, such as the ability to solve arithmetic, algebraic, and geometic problems ranging from fairly elemental to dealing with abstractions.

b. Language Development or Literacy Training (L): The acquisition of language skills, not specifically vocationally oriented, such as mastery of an extensive vocabulary; use of correct sentence structure, punctuation, and spelling; and an appreciation of literature.

Level	*Mathematical Development*	*Language Development*
6	Advanced calculus: Work with limits, continuity, real number systems, mean value theorems, and implicit function theorems. Modern algebra: Apply fundamental concepts of theories of groups, rings, and fields. Work with differential equations, linear algebra, infinite series, advanced operations methods, and functions of real and complex variables. Statistics: Work with mathematical statistics, mathematical probability, and applications, experimental design, statistical inference, and econometrics.	Reading: Read literature, book and play reviews, scientific and technical journals, abstracts, financial reports, and legal documents. Writing: Write novels, plays, editorials, journals, speeches, manuals, critiques, poetry, and songs. Speaking: Conversant in the theory, principles, and methods of effective and persuasive speeking, voice and diction, phonetics, and discussion and debate.

Level	*Mathematical Development*	*Language Development*
5	**Algebra:** Work with exponents and logarithms, linear equations, quadratric equations, mathematical induction and binomial theorems, and permutations. **Calculus:** Apply concepts of analytical geometry, differentiations and integration of algebraic functions with applications. **Statistics:** Apply mathematical operations to frequency distributions, reliability, and validity of tests, normal curve, analysis of variance, correlation techniques, chi-square application and sampling theory, and factor analysis.	Same as level 6
4	**Algebra:** Deal with system of real numbers; linear, quadratic, rational, exponential; logarithmic, angle, and circular functions, and inverse functions; related algebraic solution of equations and inequalities; limits and continuity, and probability and statistical inference. **Geometry:** Deductive axiomatic geometry, plane and solid; and rectangular coordinates. **Shop Math:** Practical application of fractions, percentages, ratio and proportion, mensuration, logarithms, slide rule, practical algebra, geometric construction, and essentials of trigonometry.	**Reading:** Read novels, poems, newspapers, periodicals, journals, manuals, dictionaries, thesauruses, and encyclopedias. **Writing:** Prepare business letters, expositions, summaries, and reports, using prescribed format, and conforming to all rules of punctuation, grammar, diction, and style. **Speaking:** Participate in panel discussions, dramatizations, and debates. Speak extemporaneously on a variety of subjects.
3	Compute discount, interest, profit, and loss; commission, markups, and selling price; ratio and proportion, and percentages. Calculate surfaces, volumes, weights, and measures. **Algebra:** Calculate variables and formulas, monomials and polynomials; ratio and proportion variables; and square roots and radicals. **Geometry:** Calculate plane and solid figures, circumference, area, and volume. Understand kinds of angles, and properties of pairs and angles.	**Reading:** Read a variety of novels, magazines, atlases, and encyclopedias. Read safety rules, instructions in the use and maintenance of shop tools and equipment, and methods and procedures in mechanical drawing and layout work. **Writing:** Write reports and essays with proper format, punctuation, spelling, and grammar, using all parts of speech. **Speaking:** Speak before an audience with poise, voice control, and confidence, using correct English and well-modulated voice.

Level	*Mathematical Development*	*Language Development*
2	Add, subtract, multiply, and divide all units of measure. Perform the four operations with like common and decimal fractions. Compute ratio, rate, and percent. Draw and interpret bar graphs. Perform arithmetic operations involving all American monetary units.	Reading: Passive vocabulary of 5,000-6,000 words. Read at rate of 190-215 words per minute. Read adventure stories and comic books, looking up unfamiliar words in dictionary for meaning, spelling, and pronunciation. Read instructions for assembling model cars and airplanes. Writing: Write compound and complex sentences, using cursive style, proper end punctuation, and employing adjectives and adverbs. Speaking: Speak clearly and distinctly with appropriate pauses and emphasis, correct pronunciation, variations in word order, using present, perfect, and future tenses.
1	Add and subtract two digit numbers. Multiply and divide 10's and 100's by 2, 3, 4, 5. Perform the four basic arithmetic operations with coins as part of a dollar. Perform operations with units such as cup, pint, and quart; inch, foot, and yard; and ounce and pound.	Reading: Recognize meaning of 2,500 (two- or three-syllable) words. Read at a rate of 95-120 words per minute. Compare similarities and differences between words and between series of numbers. Writing: Print simple sentences containing subject, verb, and object, and series of numbers, names, and addresses. Speaking: Speak simple sentences, using normal word order, and present and past tenses.

Physical Demands

The physical demands listed in this publication serve as a means of expressing both the physical requirements of the job and the physical capacities (specific physical traits) a worker must have to meet those required by many jobs (perceiving by the sense of vision), and also the name of a specific capacity possessed by many people (having the power of sight). The worker must possess physical capacities at least in an amount equal to the physical demands made by the job.

The Factors

1. Strength: This factor is expressed in terms of *Sedentary, Light, Medium, Heavy,* and *Very Heavy.* It is measured by involvement of the worker with one or more of the following activities:

   a. Worker position(s):

      (1) *Standing:* Remaining on one's feet in an upright position at a workstation without moving about.
      (2) *Walking:* Moving about on foot.
      (3) *Sitting:* Remaining in the normal seated position.

   b. Worker movement of objects (including extremities used);

      (1) *Lifting:* Raising or lowering an object from one level to another (includes upward pulling).
      (2) *Carrying:* Transporting an object, usually holding it in the hands or arms or on the shoulder.
      (3) *Pushing:* Exerting force upon an object so that the object moves away from the force (includes slapping, striking, kicking, and treadle actions).
      (4) *Pulling:* Exerting force upon an object so that the object moves toward the force (includes jerking).

The five degrees of Physical Demands Factor No. 1 (strength), are as follows:

S Sedentary Work

Lifting 10 lbs. maximum and occasionally lifting and/or carrying such articles as dockets, ledgers, and small tools. Although a sedentary job is defined as one which involves sitting, a certain amount of walking and standing is often necessary in carrying out job duties. Jobs are sedentary if walking and standing are required only occasionally and other sedentary criteria are met.

L Light Work

Lifting 20 lbs. maximum with frequent lifting and/or carrying of objects weighing up to 10 lbs. Even though the weight lifted may be only a negligible amount, a job is in this category when it requires walking or standing to a significant degree, or when it involves sitting most of the time with a degree of pushing and pulling of arm and/or leg controls.

M Medium Work

Lifting 50 lbs. maximum with frequent lifting and/or carrying of objects weighing up to 25 lbs.

H Heavy Work

Lifting 100 lbs. maximum with frequent lifting and/or carrying of objects weighing up to 50 lbs.

V Very Heavy Work

Lifting objects in excess of 100 lbs. with frequent lifting and/or carrying of objects weighing 50 lbs. or more.

2. *Climbing and/or Balancing*
   (1) Climbing: Ascending or decending ladders, stairs, scaffolding, ramps, poles, ropes, and the like, using the feet and legs and/or hands and arms.
   (2) Balancing: Maintaining body equilibrium to prevent falling when walking, standing, crouching, or running on narrow, slippery, or erratically moving surfaces; or maintaining body equilibrium when performing gymnastic feats.

3. *Stooping, Kneeling, Crouching, and/or Crawling:*
   (1) Stooping: Bending the body downward and forward by bending the spine at the waist.
   (2) Kneeling: Bending the legs at the knees to come to rest on the knee or knees.
   (3) Crouching: Bending the body downward and forward by bending the legs and spine.
   (4) Crawling: Moving about on the hands and knees or hands and feet.

4. *Reaching, Handling, Fingering, and/or Feeling:*
   (1) Reaching: Extending the hands and arms in any direction.
   (2) Handling: Seizing, holding, grasping, turning, or otherwise working with the hand or hands (fingering not involved).
   (3) Fingering: Picking, pinching, or otherwise working with the fingers primarily (rather than with the whole hand or arm as in handling).
   (4) Feeling: Perceiving such attributes of objects and materials as size, shape, temperature, or texture, by means ot receptors in the skin, particularly those of the fingertips.

5. *Talking and/or Hearing:*
   (1) Talking: Expressing or exchanging ideas by means of the spoken word.
   (2) Hearing: Perceiving the nature of sounds by the ear.

6. *Seeing:* Obtaining impressions through the eyes of the shape, size, distance, motion, color, or other characteristics of objects. The major visual functions are: (1) acuity, far and near, (2) depth perception, (3) field of vision, (4) accommodation, and (5) color vision. The functions are defined as follows:

   (1) Acuity, far—clarity of vision at 20 feet or more. Acuity, near—clarity of vision at 20 inches or less.
   (2) Depth perception—three-dimensional vision. The ability to judge distance and space relationships so as to see objects where and as they actually are.
   (3) Field of vision—the area that can be seen up and down or to the right or left while the eyes are fixed on a given point.
   (4) Accommodation—adjustment of the lens of the eye to bring an object into sharp focus. This item is especially important when doing near-point work at varying distances from the eye.
   (5) Color vision—the ability to identify and distinguish colors.

Environmental Working Conditions

Environmental conditions are the physical surroundings of a worker in a specific job.

1. *Inside, Outside, or Both:*
   I Inside: Protection from weather conditions but not necessarily from temperature changes.
   O Outside: No effective protection from weather.
   B Both: Inside and outside.

A job is considered "inside" if the worker spends approximately 75 percent or more of the time inside, and "outside" if the worker spends approximately 75 percent or more of the time outside. A job is considered "both" if the activities occur inside or outside in approximately equal amounts.

2. *Extremes of Cold Plus Temperature Changes:*
   (1) Extremes of Cold: Temperature sufficiently low to cause marked bodily discomfort unless the worker is provided with exceptional protection.
   (2) Temperature Changes: Variations in temperature which are sufficiently marked and abrupt to cause noticeable bodily reactions.

3. *Extremes of Heat Plus Temperature Changes:*
   (1) Extremes of Heat: Temperature sufficiently high to cause marked bodily discomfort unless the worker is provided with exceptional protection.
   (2) Temperature Changes: Same as 2(2).

4. *Wet and Humid:*
   (1) Wet: Contact with water or other liquids.
   (2) Humid: Atmospheric condition with moisture content sufficiently high to cause marked bodily discomfort.

5. *Noise and Vibration:* Sufficient noise, either constant or intermittent, to cause marked distraction or possible injury to the sense of hearing, and/or sufficient vibration (production of an oscillating movement or strain on the body or its extremities from repeated motion or shock) to cause bodily harm if endured day after day.

6. *Hazards:* Situations in which the individual is exposed to the definite risk of bodily injury.

7. *Fumes, Odors, Toxic Conditions, Dust, and Poor Ventilation:*
   (1) Fumes: Smoky or vaporous exhalations, usually odorous, thrown off as the result of combustion or chemical reaction.
   (2) Odors: Noxious smells, either toxic or nontoxic.
   (3) Toxic Conditions: Exposure to toxic dust, fumes, gases, vapors, mists, or liquids which cause general or localized disabling conditions as a result of inhalation or action on the skin.
   (4) Dust: Air filled with small particles of any kind, such as textile dust, flour, wood, leather, feathers, etc., and inorganic dust, including silica and asbestos, which make the workplace unpleasant or are the source of occupational diseases.
   (5) Poor Ventilation: Insufficient movement of air causing a feeling of suffocation; or exposure to drafts.

A G R I C U L T U R E

Agriculture in Montana has been divided into four specific categories: Agricultural Science (Farm-related), Agricultural Business (Non-farm), Agricultural Mechanics and Leadership Skills.

I. AGRICULTURAL SCIENCE (Livestock, Poultry and Small Animals, Crops, Horticulture and Forestry Production)

1. Livestock

A. Raising Beef Cattle

- select and evaluate breeding stock
- identify and cull unproductive cattle
- dehorn, brand, vaccinate and implant cattle
- plan calf care
- wean calves
- plan creep feeding procedures
- identify nutritional requirements
- identify reproductive systems
- market cattle
- maintain health of cattle
- identify management techniques for cattle
- maintain recordkeeping and analysis of cattle
- maintain waste management procedures
- identify handling, housing and facility uses of cattle

B. Raising Dairy Cattle

- select dairy animal
- identify reproductive systems
- plan calf care
- raise replacement heifers
- remove extra teats from heifers
- manage dry cows
- market products
- maintain health of cattle
- control milk quality standards
- operate milking equipment
- develop milking practices
- define nutrient requirements
- identify handling, housing and facility uses of cattle
- identify management techniques for cattle
- identify waste management procedures
- maintain recordkeeping and analysis of cattle

C. Raising Swine
- select and evaluate swine
- identify nutritional requirements
- identify reproductive systems
- maintain health of swine
- market swine
- maintain recordkeeping and analysis of swine
- identify management techniques for swine
- identify waste management procedures
- identify handling, housing and facility uses of swine
- care for baby pigs from birth through weaning
- wean pigs

D. Raising Sheep
- select and evaluate sheep
- identify nutritional requirements
- identify reproductive systems
- maintain health of sheep
- market sheep and wool
- maintain recordkeeping and analysis of sheep
- identify management techniques of sheep
- identify waste management procedures
- identify handling, housing and facility uses for sheep
- shear sheep

E. Raising Horses
- select and evalute horses
- identify nutritional requirements
- identify reproductive systems
- maintain health of horses
- market horses
- maintain recordkeeping and analysis of horses
- identify management techniques of horses
- identify waste management procedures
- identify handling, housing and facility uses for horses
- train horses
- maintain tack equipment and items

F. Raising Small Animals (Non-traditional)
- identify types of non-traditional animal livestock: rabbits, llamas, mink, etc.
- select and evaluate animals
- identify nutritional requirements
- identify reproductive systems
- maintain health of animals
- market animals
- maintain recordkeeping and analysis of animals
- identify management techniques of animals
- identify waste management procedures
- identify handling, housing and facility uses for animals

G. Aquaculture
- identify different species of aquaculture stock: fish, crustaceans, etc.
- identify uses for aquaculture stock

H. Poultry
- identify different types of poultry
- identify uses for poultry by-products

2. Crops

A. Small and Course Grain Production
- identify plant nutrient requirements
- identify pest management controls for diseases, insects and weeds
- maintain recordkeeping and analysis of grains
- select and evaluate cultivars, including specialty crops
- seed, harvest and store crops
- market crops
- identify types of cropping systems: no till, conventional and minimum tillage
- identify dryland irrigation systems
- identify risk management procedures
- define different types of farm programs

B. Forage Production

a. Hay Production
- identify types of hay and growth development
- identify tillage operations
- identify fertilizer requirements
- identify diseases and control
- identify insects and control
- identify weeds and control
- identify practices for harvesting and storage
- identify factors in grading hay

b. Pasture Management
- select pasture species, grass/legumes
- prepare seedbeds
- identify planting techniques
- identify weed and brush control methods
- describe methods of pastureland renovation
- identify types of grazing systems
- identify bloat hazard practices

c. Rangeland Management
- identify uses of rangeland
- identify plants found on range sites and classifications

- identify forage growth factors
- identify grazing plans/systems
- identify range descriptions
- identify range improvement practices
- identify range overgrazing prevention methods
- identify methods of weed and brush control
- identify methods of undesirable animal control
- determine stocking rate/calculate animal units

C. Specialty Crops
- identify field crops
- identify fruit crops
- identify vegetable crops
- identify berry crops
- identify types of Christmas trees

3. Horticulture

A. General Horticulture
- identify terms and definitions associated with horticulture
- identify plant growth and reproduction systems
- identify types and classifications of plants: life cycles, annuals, bi-annuals and perennials

B. Identify Plant Reproduction Elements
- identify types, properties and profiles of soils
- define methods of soil testing
- maintain sample taking records
- identify sample reading and interpretation methods
- identify nutrient requirements
- identify types of plant nutrient deficiencies: zinc, potassium, iron, phosphorous, nitrogen, etc.
- identify specific nutrient requirements for: trees/shrubs, lawn/turf, garden products, fruit and small fruit trees, and flowers
- identify types of soil conditioners and additives
- define organic and inorganic compounds: mulches, composts, manures, charcoal and fertilizers
- identify specific formulations: granules, liquids and gases
- identify specific application procedures: rates/needs, handling, storage, recordkeeping
- define timing requirements for lawn grasses, garden vegetables, fruit and small fruits, trees/shrubs, and ornamentals

C. Identify Water and Water Quality Procedures
- identify water quality techniques
- define sample taking procedures
- define sample reading and interpretation procedures
- identify water/soil/plant relationships for: lawn grasses, garden vegetables, trees and shrubs, ornamental trees and shrubs, fruit and small fruits
- identify water management techniques for soils and plants

D. Maintain Landscaping
- identify landscaping techniques
- define basic principles of landscaping
- identify types of design and plan development
- select materials
- select plants
- identify moisture requirements
- identify light requirements
- identify temperature requirements
- identify maintenance and energy saving procedures for plants
- identify proper groundcover designs for: trees, shrubs, grasses
- identify proper structure designs for: rock gardens, fill materials, fences, etc.

E. Identify Trees and Shrubs
- define landscaping techniques relevant to Montana
- identify varieties of trees and shrubs indigenous to Montana
- identify types of planting and transplanting
- define various types of preparation procedures
- define types of care and maintenance
- identify types of soils and materials needed
- identify watering requirements
- identify pruning requirements
- identify fertilizing requirements
- diagnose problems in pest control
- diagnose problems in pruning
- define environmental conditioning
- define winterization methods
- define harvesting methods
- identify packing and unpacking techniques
- identify storage methods
- identify marketing techniques
- define uses for windbreaks and shelterbelts
- define various types of Montana windbreaks and shelterbelts
- identify various types of design and planning
- identify procedures for preparation and planting

- maintain and care for windbreaks and shelterbelts
- define requirements for pest control from weeds, insects and disease
- define requirements for watering
- define requirements for fertilizing
- define requirements for pruning
- identify environmental concerns

F. Identify Turfs
- define production techniques
- identify turf usage for residential landscapes
- identify turf usage for commercial landscapes
- select and identify various grasses
- prepare seed beds
- plant seed beds
- maintain and care for seed beds
- water turf
- fertilize turf
- mow turf
- identify pest and disease control agents: weeds, disease, insects - biological, cultural and chemical
- explain environmental conditioning
- discuss winterization techniques
- harvest turf
- market turf

G. Identify Flowers, Fruits and Vegetables
- identify types of trees, shrubs, small fruits, vegetables and flowers
- identify types of interior house plants
- identify types of exterior plants
- identify types of production area design
- identify types of companion cropping
- identify propagation and reproduction techniques
- prepare plants for planting and transplanting
- maintain and care for plants
- identify methods of watering, clipping or pruning, and pest control of plants
- harvest plants
- identify storage techniques
- identify packing methods
- market plants

H. Identify Pest Control Techniques
- identify types of insect, animal, rodent, weed, and disease control
- identify pest management techniques
- discuss biological and chemical control techniques

- identify various types of pesticides, herbicides, fungicides, and rodentcides
- read and understand labels
- following safety and toxicity precautions on labels
- mix and spray pesticides
- identify time requirements for pesticides
- identify clean up methods
- identify storage and winterizing methods
- dispose of pesticides

I. Use Lawn, Garden, and Ornamental Equipment
- use hand tools
- use gas tools
- use electric tools
- use small engines
- maintain small engines
- follow safety precautions for small engines
- store small engines properly

J. Identify Greenhouse Systems
- identify greenhouse construction methods
- identify structure designs
- identify maintenance requirements for greenhouses
- identify equipment used in greenhouses
- identify building preparation and maintenance methods for greenhouse production

K. Identify Professional Opportunities in Horticulture
- identify occupational opportunities in landscaping and plantscaping
- identify occupational opportunities in commercial horticulture
- identify occupational opportunities in park and recreational horticulture
- identify opportunities in garden/truck farming
- identify opportunities in groundskeeping
- identify opportunities in nursery businesses
- identify local, state and federal regulations
- identify opportunities in golf course management
- identify opportunities in turf growing and maintenance

4. Forestry

The Montana Technical Committee on Forestry and Lumbering has validated a separate task list for this industry.

II. AGRICULTURAL BUSINESS

1. Agriculture Business Technology

A. Apply Business Practices
- maintain ledger of accounts
- determine cost efficiency of operation
- prepare a tax return
- prepare a budget
- determine credit, cash flow and investment returns
- review sources and kinds of insurance required
- review bonding needs and procedures
- list major sources of business credit and loans
- maintain inventory control

B. Market and Merchandise Goods and Services
- display goods
- manage sales
- open and close office daily
- update price list for goods and services
- prepare advertising
- handle customer complaints and questions
- take order for goods and services by telephone
- inspect and follow-up quality of services performed for customer
- advise customer in the selection of goods or services

C. Prepare Communications for the Public
- prepare instruction for the care of animals, plants and equipment
- provide verbal instructions on care of animals, plants and equipment
- demonstrate use of tools and equipment

D. Display and Sell Merchandise
- display plants and animals
- display equipment and tools
- display feeds, seeds, hardware, fertilizers and pesticides
- fill customer orders
- help customer select plants, animals, and other merchandise
- take orders by phone
- weigh out bulk merchandise for customer
- inspect and follow-up quality of services performed for customer
- describe purpose and quality of products sold
- analyze entrepreneur and enterprise systems

E. Maintain Computer (PC) Literacy
- define the following terms: computer; data; input; output; hardware; software; language; processing - word, data; memory - RAM, ROM; program; terminal; peripheral devices and keyboard characters and controls

- operate a computer by performing the following steps: turn the equipment on and off; load a program; run and use a program; store a program; display a program and enter and execute a simple program
- identify the safety precautions that must be observed in using equipment
- describe the general use of computer technology in agricultural business
- discuss the advantages and disadvantages in use of different computers

F. Handle Merchandise
- load and unload delivery vehicles
- store received plants, animals and supplies
- prepare plants and animals for shipment
- store agricultural and flammable chemicals safely

2. Pest Control Technology

A. Manage and Supervise the Application of Pesticides and Agricultural Chemicals
- recognize pesticide and chemical poisoning symptoms
- read and interpret packaging labels and guidelines for safety
- read and interpret package labels for applications rates and instructions
- recommend kinds of pesticide and agricultural chemicals to be used in specific situations.
- use protective clothing and equipment when handling agricultural chemicals
- recognize symptoms of pesticide, chemical and residue damage
- calculate coverage of chemical
- assess compatibility of selected chemicals
- determine rate and volume of chemical to be applied
- select time of chemical application
- select and match nozzles for equipment type, chemical used and pattern of application
- safely store chemicals
- mix chemicals and carrying agents
- apply granular or dry chemical materials
- apply liquid materials
- adjust ground speed of chemical application equipment
- dispose of used chemical containers

B. Supervise and Train Personnel in the Safe and Efficient Use of Pesticides and Agricultural Chemicals
- develop a labor supply plan
- hire and dismiss employees
- establish and record pay scale and benefits for workers
- instruct employees in the safe and efficient use of chemicals and equipment

- observe and evaluate employees
- maintain safety standards in the application of agricultural chemicals
- observe rights and needs of employees
- post appropriate health and safety announcements
- give and take verbal and written instructions
- maintain a safe working environment

C. List and Interpret Law and Regulations Relative to the Safe Application of Pest Control Materials
- observe local, state and federal pesticide and agricultural chemical regulations
- observe EPA regulations
- list agencies responsible for the regulation of the pest control and chemical application industry
- attend workshops and seminars to upgrade skills and knowledge
- maintain a file for technical information, periodicals and other information
- determine sources of up-to-date information and services
- list societies, organizations and associations relative to the occupation or profession

D. Manage the Maintenance of Equipment Used to Apply Pest Control Materials
- inspect safety equipment for cleanliness effectiveness and proper fit
- inspect equipment for leaks, clogs, improper equipment for job and other malfunctions
- adjust pressure and spray patterns
- adjust equipment height and width
- adjust mixing apparatus
- repair or replace hoses, nozzles and cut-off valves
- prepare equipment for storage
- order replacement parts and supplies
- supervise and/or perform maintenance and repairs
- lubricate equipment
- follow operators manual
- repair and/or maintain dusters
- repair and/or maintain fumigators
- supervise and/or maintain vehicle maintenance and minor repair
- maintain and use shop equipment and tools
- clean and flush chemical application equipment
- describe compatibility of equipment with chemicals used

E. Qualify for Appropriate Certification to Apply Pest Control Materials
- interpret certification and licensing requirements
- identify qualification needed for various certificates or licensure
- apply for license or certificate
- maintain license or certificate

F. Keep Accurate Records Required by Law and for Business Management Purposes
- maintain personnel records
- maintain health and accident records
- maintain equipment maintenance records
- keep and maintain complete pesticide application records
- keep records of employee training and licensure
- file required local, state and federal reports
- maintain inventory control of pesticides and chemicals

G. Classify and Identify Pests and Appropriate Chemicals Used to Control Them
- identify fungi and bacteria and their symptoms
- recognize symptoms of insects and nematodes
- classify feeding habits and life cycles of insects
- describe life-cycles of bacteria and fungi
- consider the pet, host being attached and chemical when recommending chemical control measures
- assess environmental impact when recommending chemical control measures
- identify insect, weed and other pests

III. AGRICULTURAL MECHANICS

A. Practice Safe Work Habits
- keep shop/work area clean and orderly
- operate a fire extinguisher
- use appropriate protection devices
- administer basic first aid
- identify hazardous conditions
- deal with hazardous conditions
- follow safety procedures according to operator's manuals
- follow safety procedures during towing operations
- follow safety procedures during oversized load operations
- identify safety practices for keen-edge, striking, struck, and grinding tools

B. Caring for Hand Tools

- identify appropriate shape of cutting edges
- select abrasives for grinding and sharpening
- recondition hand tools
- recondition chain saw cutting parts
- recondition pneumatic and electric tools

C. Using Fasteners
- select fasteners for given application
- join wood with appropriate fasteners
- join metal with appropriate fasteners
- join plastic materials using appropriate methods
- join combinations of materials

D. Working with Cold Metal
- identify various types and shapes of metal
- determine tap and drill sizes
- select files and saw blades
- bend sheet and strap steel to angles or shapes
- make and repair threads
- safely cut metal with proper tool
- layout and drill holes

E. Working with Hot Metal
- identify the procedure for heat treating
- solder sheet metal joints and seams
- solder electrical connections
- expand metal to remove studs, nuts, bearings
- select soldering equipment and tools

F. Using Oxy-Acetylene Equipment
- observe safety practices when operating equipment
- set up equipment for welding, cutting, heating and brazing
- separate metal using oxy-acetylene
- select welding rod and flux
- joining metals by welding or brazing
- remove bearings from shaft

G. Use Arc Welding Equipment
- select arc welding machines and equipment
- read drawings and welding symbols
- control distortion in arc welding
- select appropriate sizes and types of welding electrodes
- select and apply hard surfacing alloys
- layout and prepare metal for arc welding
- apply beads, butt or fillet welds for five types of welded joints in all positions

H. Work With Wood
- mark wood
- select and use appropriate tools
- identify various types of wood and their appropriate uses
- layout projects according to drawings
- joint woods with proper material (fasteners and adhesives)

I. Planning For Project Construction
- sketch a plan
- estimate needed materials
- estimate cost of materials
- read a blueprint
- identify necessary local, county and state building codes

J. Building Wood Structures
- select and lay out a building site
- layout a plate
- construct buildings or building components
- layout and cut rafters, braces and other members to dimensions
- construct trusses with different building materials
- install composition shingles, metal and fiberglass roofing materials
- select and install insulation materials
- select appropriate building materials
- identify environmental problems in livestock and crop buildings
- construct forms

K. Applying Paint/Finish
- observe safety practices when painting/finishing
- select preservatives for building materials
- prepare surface for application
- apply preservatives using appropriate methods

L. Using Concrete and Masonry Products
- perform a differential leveling procedure
- prepare a site for concrete
- test quality of aggregates and materials
- determine moisture in sand
- estimate needed materials and quantities
- mix concrete
- place order for ready mix concrete
- place reinforcement devices
- conduct a slump test
- place, consolidate, and finish concrete
- make isolation, control and construction joints
- place anchoring devices
- produce special finishes
- use concrete finishing tools and equipment

M. Utilizing Electric Power
- observe safety practices when working with electricity
- perform electric demand load management practices
- select conductor type and size for application
- select adequate and appropriate lighting

- reset a circuit breaker
- attach conductors to terminals
- determine circuit protection requirements for a given application
- install circuit protection devices and ground fault circuit interrupters
- test an electrical circuit for continuity
- develop a plan for providing electric service to a building
- interpret information on an electric motor name plate
- select motor size and type for a given application
- reverse the direction of rotation on an electric motor
- reconnect leads to change voltage on an electric motor.
- select controls for electrical applications
- install electric motor and drive assembly
- discuss robotics usages
- identify basic electronics skills
- identify and select appropriate sensing devices

N. Installing Plumbing and Fitting Pipe
- determine and select pipe/PVC/tube type and size for a given application
- identify pipe fittings by type
- select and use pipe threading and cutting tools
- calculate lengths of pipe
- cut, thread and assemble pipe or tubing
- connect flare and compression fittings
- solder copper fittings

O. Erecting Fences
- identify types of fencing systems
- lay out fence line
- construct fence
- install a splice in a wire fence
- build gates
- hang gates
- troubleshoot electric fences

P. Planning a Farm Building
- select site
- plan building layout to match job application
- plan storage system
- plan for electrical service
- plan for heating
- plan for ventilation
- plan for lighting
- plan for distribution of air, gases, fluids
- plan for waste disposal system
- plan for drainage system
- plan for environmental impact

Q. Servicing Small Gasoline Engines
- read and interpret operator's manual
- read and interpret service/technical/parts/overhaul manuals
- use engine overhaul equipment, including valve, cylinder, piston, seal and gearing tools
- use measuring tools and test instruments
- service the air cleaner and lubrication system
- assemble and adjust ignition and fuel system components
- troubleshoot engine operation
- operate the engine and adjust or check ignition timing, engine speed, and carburetor adjustments
- evaluate engine parts for ordering and service
- select correct fuels and lubricants

R. Servicing Tractors
- read and interpret operator's manual
- read and interpret service/technical/parts/overhaul manuals
- design maintenance schedule
- keep maintenance records
  order parts utilizing serial numbers and part numbers
- clean tractor
- check and adjust tire pressure level to job application
- inspect belts and pulleys for serviceability
- remove, replace, and adjust belts
- service and repair fuel system components
- service and repair air system components
- service and repair cooling system components
- service and repair lubrication system components
- service and repair hydraulic system components
- service and repair brake system components
- service and repair clutch components
- service and repair ignition system components
- service and repair charging system componenets
- service and repair starting system components
- service and replace bearings
- service and adjust valve train components
- service, adjust or repair compression system componenets
- trouble shoot engine performance
- select fuels, lubricants and greases
- conduct a pre-operation inspection of a tractor
- service or repair air conditioner system components
- make hitch and PTO adjustment
- test electrical sensing devices

S. Servicing Agricultural Machinery
- read and interpret operator's manuals
- read and interpret service/technical/parts/overhaul manuals
- design maintenance schedule
- keep maintenance records
- perform preventative maintenance procedures
- clean machines
- lubricate machines
- prepare machinery for storage
- remove and replace worn/broken parts
- order parts utilizing serial number and part number
- determine parts and consumable items to be on inventory
- calibrate planting equipment
- calibrate a sprayer
- adjust tillage implements to meet job requirements
- adjust planting implements to meet job requirements
- adjust fertilizer applicators to meet job requirements
- adjust sprayers to meet job requirements
- adjust haying equipment to meet job requirements
- adjust livestock handling equipment to meet job requirements
- adjust manure handling equipment to meet job requirements
- adjust milk handling equipment to meet job requirements
- adjust combines to meet job requirements
- adjust grain handling systems to meet job requirements
- adjust forage harvesting equipment to meet job requirements
- test and adjust sensing devices

IV. LEADERSHIP SKILLS

A. Identify Leadership, Communications, Employability and Human Relations Skills
- establish personal and professional goals
- conduct a job search
- secure information about a job - identify documents that may be required when applying for a job
- complete a job application form correctly
- demonstrate competence in job interview techniques
- demonstrate appropriate listening skills on the job
- demonstrate decision-making ability
- determine personal progress
- identify the importance of motivation on the job
- identify or demonstrate appropriate responses to criticism from employer, supervisor, or others

- identify acceptable work habits
- use job time wisely
- demonstrate knowledge of how to make job changes appropriately
- demonstrate acceptable employee health habits
- demonstrate positive self-concept professionally and personally

B. Identify Basic Skills Relevant to Agriculture
- maintain knowledge of mathematical and computational skills
- maintain knowledge of modern scientific theory and principles of agriculture and related topics
- demonstrate effective written and verbal communication skills

C. Maintain Civic Responsibility

SUMMARY

Montana's agricultural industry must require highly-trained workers in a sophisticated global market, according to the Agricultural Technical Committee.

Perhaps the most underlying priority need, the committee stated, was a solid foundation in general education for all agricultural workers - farm or non-farm.

The state's farm and non-farm workers will require continued training and up-grading in their fields to stay on the cutting edge of technological advancements.

The committee unanimously agreed that leadership, communication and computational skills are the desirable qualities necessary for all agricultural workers.

Business skills and a broad-based general knowledge of all agricultural areas will also be mandatory skills necessary for productive employment, they noted.